DOCUMENT RESUME

ED 441 014 TM 030 812

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TITLE Is It Time To Take the Paper Out of Serial Publication?
PUB DATE 2000-04-00
NOTE 8p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 24-28, 2000). In: "Medical Education Online" v4 1999.
AVAILABLE FROM For full text: http://www.med-ed-online.org.
PUB TYPE Reports - Evaluative (142) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Electronic Journals; *Research Reports; Scholarly Journals; *Writing for Publication

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TM030812

This paper is prepared for the:
Annual Meeting of the American Educational Research Association in New Orleans
April 2000

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Med Educ Online [serial online] 1999;4:7. Available from URL:http://www.Med-Ed-Online.org

Is it Time to Take the Paper Out of Serial Publication?

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Abstract - The ramifications of shifting from paper to electronic serial publication are discussed in light of the recent National Institutes of Health (NIH) proposal for a comprehensive electronic archive of peer-reviewed and preprint publications. The paper evaluates six concerns that have been expressed about the conversion to a purely electronic journal system and discusses the economic impact and growing tension among authors, publishers and librarians over scholarly publication.

Introduction

Four years ago LaPorte and colleagues predicted the death of biomedical journals.[1] Although the growth of the Internet is likely to have a significant impact on the eventual structure of scholarly communication, the final outcome is not clear at this time. With the backing of the National Institutes of Health (NIH), Harold Varmus's recent proposal for a comprehensive electronic distribution system for research papers in the biomedical sciences has brought the debate to the forefront and may eventually turn out to be a giant step towards making LaPorte's prediction a reality.[2]

The current system for disseminating and archiving scientific findings through bound serial publications has served the scientific community reasonably well since it was initiated by the Royal Society of London in 1665.[3] The system, however, has become exorbitantly expensive and is probably obsolete. It has gotten to the point where librarians are calling the current situation a serial crisis.[3-5] There has been a dramatic increase in the price of journal subscriptions that is limiting the ability of even well funded research libraries to carry the full complement of journals. What is worse is the drop in the number of journals carried by libraries is forcing publishers to raise prices generating a vicious circle of spiraling costs.[5]

There is a heated debate involving authors, publishers and librarians concerning how scientific findings will be reported in the future .[5-8] The financial stakes are high and in one case the debate has resulted in a series of international lawsuits.[9] Advances in technology have started to change the relationship among these three groups but the ultimate structure of the system for disseminating scientific communication is still very much in flux. The future roles of publishers who evaluate, edit, package and distribute scientific papers and the librarians who collect, organize and ultimately provide researchers with access to these papers are threatened by these changes. Technology has the potential to automate many of the most time consuming and resource intensive functions of both these groups. Although important roles will remain, there is likely to be significant downsizing in the publishing industry and a reduction in the scope of research libraries. It is also still not clear what sort of organizational structure will fulfill the roles that are left.[4] What at this point does seem clear is that wide-area networks, inexpensive computer hardware and sophisticated software have the potential to dramatically change the relationship among authors, publishers and librarians.

The Current Situation

Currently, formal scholarly communication in most scientific fields is conducted pretty much as it has been for many years. Scientific communication and documentation of research findings are accomplished through serial publications that are to some extent owned by scientific societies but more commonly owned by commercial publishers. Three new developments however are taking place though to varying degrees across the scientific disciplines. These include the development of informal electronic preprint systems, electronic versions of traditional paper journals and newly formed purely electronic journals.

An informal preprint system for exchanging scholarly information has grown up in a number of fields filling some but not all the roles of print journals. Preprints are draft papers exchanged informally among colleagues prior to traditional publication. The most notable example is Paul Ginsparg's "XXX" archive (http://xxx.lanl.gov) which has been in existence since 1991.[10,11] XXX is an automated archive of preprint research papers in physics and more recently in several other fields. Even in physics where Ginsparg's archive has become a predominant means of distributing research papers, most authors still

published their papers in traditional journals mainly to get "academic credit" for career advancement.

There has also been a dramatic increase in the number of electronic journals. The Association of Research Libraries listed 3,400 in 1997, doubling from the previous year.[7] Even more dramatic was the 2,000% increase in peer-reviewed electronic journals, from 47 to 1,002. To some extent the increase, particularly in peer-reviewed journals, has consisted of traditional paper journals distributing electronic versions. While pricing structures vary, generally commercial publishers have charged an additional fee and in many cases have only made the electronic version available to institutions and individuals that subscribe to the paper version. There has also been a proliferation of purely electronic journals, some peer-reviewed but most not. These journals are generally distributed via the Internet at no charge. In many cases they have disappeared as quickly as they have appeared.[3]

Though electronic journals are proliferating and alternate means of distributing scientific papers such as preprint archives exist, to this point in time paper journals and their electronic clones have remained the dominant mode of distributing and archiving scientific communication. According to Schaffner there are at least four core functions of a scientific journal.[12] These include building a collective knowledge base, communicating information among scholars, distributing rewards, and creating scientific communities. At least in high-energy physics, Ginsparg's XXX archive has made some significant inroads in the functions of building a collective knowledge base, communicating information among scholars and creating a scientific community. The function of what Schaffner calls distributing rewards or what I have termed "academic credit" appears to be the most resistant to change. This is true even in physics which is leading the movement to electronic only formats. Social institutions change slowly and tradition of using peer-reviewed publication in prestigious journals as a major factor in assessing scientific productivity is deeply imbedded in the social fabric of scientific communities.[12]

Concerns about Moving to an Electronic System

Beyond inertia, several concerns have been expressed about moving to a purely electronic system for serial publication. Harnad lists five issues that encompass many of the major concerns that are commonly voiced.[7] I have added a sixth issue that is also often presented.

1. With constantly changing digital formats and the rapid proliferation and demise of electronic journals, important scientific material might not be preserved.
2. For reading extended amounts of text, paper is much more convenient than computer screens.
3. It will be difficult to maintain the rigorous quality control provided by peer-review and limited acceptance rates in the prestigious traditional journals.
4. The credit, recognition and advancement (academic credit) provided by publishing in prestigious journals would not be available in electronic journals.
5. Electronic media will facilitate and encourage plagiarism.
6. People in remote areas and in developing countries will not have access to electronic publication.

The first concern is a real but solvable technical issue that will require one or more essentially permanent institutions with adequate resources to insure that the body of information in electronic journals is preserved and readily available to researchers. Research libraries have traditionally fulfilled the archival role for paper journals but at a very high cost.[4] Though they are currently not structured to do this, it is conceivable that research libraries could fill this role for electronic journals at a significant cost saving. A centralized model such as the one proposed by the NIH, which at the moment is being called "PubMed Central", may make more sense and probably would be more efficient. It is also likely that "mirror" sites would supplement such an archive providing redundancy at multiple locations helping ensure the safety and responsiveness of the system.

The second concern in my view is a non-issue. Today all journals are electronic at some point. Traditional journals are just converted to a paper format prior to distribution. From a logistical standpoint this does not make much sense. High-resolution monitors are inexpensive and readily available. They are perfectly adequate for manipulating electronic media, skimming abstracts and locating manuscripts for further review. When a manuscript is located for full review, it is true that most people would rather read it on paper. Inexpensive high resolution printers that can print five to eight pages a minute are currently available for as little as $100 (US) in the USA and are often bundled with the purchase of a computer. Access to convenient high-quality printing is generally not an issue. It is simply a matter of printing off the material one wants to read and only the material

one wants to read at the point in the space-time continuum that one wants to read it.

If one digs below the surface the third concern is spurious. Peer-review and a rigorous selection process are media-independent and can be as easily implemented in an electronic as paper form.[7] The only real issue that differentiates between paper and purely electronic journals is the high per-page costs associated with producing and distributing paper journals. This conceivably can, and I suspect often does impact on publication decisions. In electronic journals it is possible to publish as much material as is available that meets whatever criteria the editor or editorial board chooses to set. With paper journals there is the artificial economic issue of publication costs.

It is often stated or implied that publishers are a key or even required aspect of the peer-review process that ensures high quality publications.[6,8,14] Frank Bloom, editor of *Science* has even gone as far to state in an editorial that scientists are incapable of producing "quality information" without the help of publishers.[8] This chauvinistic assertion is not only insulting it is false. Publishers have traditionally organized and managed the review process but it is a "***peer-review***" process by definition. The process is conducted by other scientists and is generally done gratis for the publisher. The editors who assimilate reviews and make publication decisions are more often than not themselves scientists who perform the task as a service to their profession while receiving at best a small honorarium. The publishing company plays the limited role of funding the mechanics of the review and revision process. Even the cost and effort required for this role can be substantially reduced by conducting the review/revision process electronically.

The notion electronic journals can not bestow "academic credit" is also spurious and linked to the issue above. As purely electronic journals develop that are as selective and rigorous as the top traditional journals the prestige of publishing in them will quickly follow. Presently electronic-only journals are burdened with a "chicken and egg" problem. Researchers are reluctant to publish their best research electronically due to the valid concern of not getting appropriate credit. At the same time the research community will not bestow significant academic credit to electronic publications until it perceives that high quality material is being published in purely electronic journals. As a significant number of high quality manuscripts begin appearing in purely electronic journals, this perception will begin to erode. Eventually attitudes will change but it is likely to be a slow process since careers are at stake. A system like PubMed Central sanctioned by the NIH is likely to speed the process of "legitimizing" electronic publication. In my view legitimizing electronic publication is likely to be PubMed Central's greatest contribution to science.

The issue of plagiarism is simply a non-issue. Plagiarism is plagiarism whether the media is digital or paper. Electronic format only serves to make it slightly more convenient to commit. In either electronic or paper form plagiarism constitutes scientific misconduct. With search engines and electronic archiving a seamless component of electronic publishing, if anything, electronic publication will make plagiarism all the easier to detect and document. I suspect this will be far more of a disincentive than the slight incentive of convenience.

The issue of access on the surface appears to be a legitimate but in reality just the opposite is true. Electronic publication offers the best, most effective means of providing complete worldwide access to the biomedical literature. In my view this is one of the most compelling arguments for moving in the direction of purely electronic publication that is freely available to all that wish to access it. While there are undoubtedly places where access to the Internet is not available or cost prohibitive, they are shrinking fast. More to the point, when wealthy research universities in the USA are having difficulty affording to maintain their collections of paper journals, it is doubtful whether people at locations without the Internet have even minimal access to the biomedical literature. Currently, in the USA it costs as much for a yearly library subscription to a typical biomedical journal as it does to purchase outright an Internet capable computer, printer and several years of Internet access from a commercial Internet service provider. While the cost of equipment may be higher elsewhere, so are journal subscriptions. With a growing backbone as well as satellite links, spending the one-time costs of providing Internet access anywhere in the world makes far more sense than producing and hauling tons of paper to remote locations.

The Current Power Struggle

Paradigms do not change easily.[15] Given that large sums of money, careers and even the future of some fairly large organizations are at stake, it is not surprising that the current debate concerning scientific publication has often gotten nasty. There is a power struggle going on that the PubMed Central proposal is bringing to the forefront.

The symbiotic relationship among authors publishers and librarians has worked reasonably well for many years. Recently however serious strains have been developing among the three groups. Despite the fact that all three have been dependent on each other, publishers have controlled the relationship. Though authors produce the raw material, publishers control the distribution system and most importantly access to publication in prestigious journals key to career advancement for the authors. Though library subscriptions are the main source of income for the publishers of scholarly journals, librarians appear to have had little choice but to purchase the key journals within a field at whatever price is being charged and with whatever access restrictions are being imposed.[16]

Probably the most central issue in this power struggle between authors and publishers is copyright ownership. The publishers have universally demanded and gotten authors to sign over copyrights to their material as a precondition for publication, generally at no cost to the publisher. In response to the XXX archive, several journals in physics have even gone so far as to refuse to publish papers that were originally distributed in draft form as preprints.

Publishers are demanding the copyright despite the fact that there are mechanisms for authors to assign publishers adequate rights to distribute an author's material without signing over the full copyright.* Since the publishers have been so universal in this demand, authors have had little choice in the matter. The democratizing impact of electronic publication, and the tendency for purely electronic journals not to demand copyright ownership, is bringing the argument to a head.[17,8]

The spiraling cost of subscriptions along with the access and fair-use restrictions publishers are placing on the electronic versions of traditional journals are increasing the tension between publishers and librarians. In response, libraries are organizing into consortia to gain the necessary clout to negotiate head to head with massive commercial publishing companies such as Elsevier Science.[16]

Few would argue that scholarly publication is going to eventually move to a predominantly electronic format. It just makes too much sense. The time frame in which this will happen, the eventual structure that will evolve to replace the current system and the means by which the new electronic system will be financed are still unclear. What is clear is that the shift to electronic publication will significantly change the power structure and the relationship between authors, publishers and librarians.

The Cost of an Electronic Journal System

While an electronic delivery system will certainly reduce the resources required for production and distribution of serial publications the issue is complex. Under the present paper system, a typical journal article grosses approximately $4,000 (US) in subscription fees.[4] What is often forgotten is that is only a portion of the actual costs of delivering the material to the ultimate consumer, the reader. Libraries in aggregate spend approximately $8,000 *in addition* to subscription fees to archive, catalog and distribute a journal article.[4] Studies suggest that on average a scientific journal article is read by about 200 people. Putting this together, it costs about $60 to deliver a journal article to a reader. In reality this is also probably an underestimate since the reviewers' and often the editor's respective employers subsidize their efforts in selecting and refining peer-reviewed journal articles.[18]

How much of a saving will the move to an electronic system produce? It is not clear but it should be substantial. Cost reductions in the 70% range on the publication side are probably realistic. Resources are still required for three activities, peer-review/scientific editing, copy editing, and formatting/typesetting. Fellow scientists have traditionally conducted peer-review and scientific editing tasks for journals at essentially not charge. Only the costs associated with the secretarial support for these activities remain. When done electronically, material and operations costs (printing, mailing fax etc.) of peer-review/scientific editing become minimal. The costs associated with copy editing and typesetting will remain however to some extent the effort required to perform these tasks has also been reduced by sophisticated desktop publishing software.

The savings on the library side where the bulk of the costs occur are also likely to be substantial, quite possibly even larger than on the publication site. The physical structures required to house paper journals and the small armies of undergraduate students required to check journal volumes in and out of the library and re-shelve them after use will no longer be needed. Probably all that will need to remain physically at research centers for accessing serial publications are well-trained research librarians. The costs

* Personal communication with Georgia Harper, J.D. Manager of the Intellectual Property Section in the General Counsel's Office for the University of Texas System.

to archive and distribute the material electronically will be relatively small in comparison to what it costs to maintain paper archives though still substantial. NIH however appears to have agreed to cover these costs at least initially through PubMed Central.

The Future

One aspect that is often glossed over in the discussion of electronic publication is that it is not simply a matter of taking the current paper system and sticking it on the Web. While this approach has to a large extent been the norm when traditional paper journals have been converted to electronic format, it makes meager use the true potential of electronic publication. Electronic publication opens up a whole new set of possibilities as well as some potential problems that will require a different set of conventions. Burbules and Bruce provide a thoughtful discussion of the issues of electronic publication that seems as pertinent today as it did when published five years ago.[19] It is likely to take some time to fully understand the true potential of electronic publication and how best to make use of it. In addition it will be necessary to understand the problems and develop a new set of conventions and procedures for making the system to work smoothly.

It is also pretty clear that control of scientific publication will shift away from the publishers. The Internet, if nothing else, has a tremendous democratizing impact. Virtually anyone who chooses to do so can publish electronically and make their material available to the world. While this has the potential of drowning us in garbage, it certainly does not mean it is all garbage. Publishers currently have a monopoly on the most prestigious scientific journals but they do not have a monopoly on quality scientific thought. In theory all it would take is a shift in attitudes and conventions among the scientific community for the current publishers to be cut completely out of the equation. In a very real sense the Internet has provided the scientific community with the ultimate trump card in determining who controls scientific communication.

This is not to say the publisher will not retain substantial influence. They have tremendous resources and a wealth of valuable experience and expertise. Even more importantly they own the current body of published scientific thought. At the same time I would not necessarily suggest buying stock in Elsevier Science. If publishers continue to stonewall both the authors on control of their own material and librarians on pricing and access issues, it is quite conceivable that they could end up out of business. With the Internet they are simply no longer as essential as they once were. As noted by Odlyzko[4], the recent history of the *Encyclopaedia Britannica* provides an interesting if not perfectly parallel analogy as to what may happen to journal publishers. Despite tremendous resources, a 200-year history and a stellar reputation as the best in the business, the company quickly went into financial collapse in the face of $50.00 "upstart" CD-ROM encyclopaedias. What is encouraging is the newly emerged company trimmed its bloated administrative overhead and sales force and is now selling electronic access to there encyclopaedias on CD-ROM and via the Internet at a competitive price while apparently increasing the editorial staff by 25%.[4] Like the *Encyclopaedia Britannica*, journal publishers can thrive in an age of electronic communication but they will have to become smaller, leaner and more flexible in how they partner with both authors and librarians.

The conversion of written material from paper to electronic media is a process that is taking place gradually and is likely to extend over several decades. Not surprisingly it has happen most quickly for material like encyclopaedias where it makes the most sense. It will happen slowest for material like books where it makes the least sense. Scholarly periodicals are probably somewhere in between but I suspect a lot closer to the encyclopaedias.

Electronic communication is also shifting some of the roles journals have played in the past to other modes of communication. Listservs, preprint archives, and threaded discussion forums are taking over the role of creating scientific communities and facilitating more informal timely and interactive exchanges of information. Peer-reviewed serial journal articles however are likely to remain at the top of the scientific communication pyramid as carefully crafted and polished documentation of research findings that bestow the most amount of academic credit. They however will be electronic, more easily accessible, and to a greater extent under control of the scientific community who produce and consume the information.

References

1. LaPorte RE, Marler E, Akazawa S, Sauer F, Gamboa C, Shelnton C, Glosser C, Villasenor A, Maclure M. The death of biomedical journals. BMJ 1995;310:1387-1390.

2. Varmus H. E-BIOMED: A proposal for electronic publication in the biomedical sciences. Available from:

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http://www.nih.gov/welcome/director/ebiomed/ebi.htm [accessed 8/20/99]

3. Walker TJ. Free Internet access to traditional journals. Amer Sci 1998;86. Available from http://www.amsci.org/amsci/articles/98articles/walkerweb.html [accessed on 8/21/99]

4. Odlyzko AM. Competition and cooperation: Libraries and publishers in the transition to electronic scholarly journals. *J. Scholarly Publishing* 1999;30(4):163-185. Available from http://www.research.att.com/~amo/doc/eworld.html [accessed on 8/20/99].

5. Branin JJ Case M. Reforming Scholarly publishing in the sciences: A librarian perspective. Notices of the AMS Available from http://www.ams.org/notices/199804/branin.pdf [assessed on 8/21/99]

6. Edelson AM. On the future of scholarly journals. Science 1998;280:359. Available from http://www.sciencemag.org/cgi/content/summary/280/5362/359 [accessed on 8/21/99]

7. Harnad S. On-line journals and financial firewalls. Nature 1990;395:127-128. Available from http://www.princeton./edu/~harnad/nature.html [accessed on 8/19/99]

8. Bloom FE. The rightness of copyright. 1998;281:1451. Available from http://www.sciencemag.org/cgi/content/summary/281/5382/1451 [accessed on 8/22/99]

9. Gordon & Breach v. American Institute of Physics and American Physical Society summary of the litigation. Available from http://barschall.stanford.edu/index.html [accessed on 8/24/99].

10. Ginsparg P. Winners and losers in the global research village. Available from http://xxx.lanl.gov/blurb/pg96unesco.html [accessed on 8/20/99]

11. Harnad S. Scholarly skywriting and the prepublication continuum of scientific inquiry. Psychological Science 1990;1:342-343.

12 Schafner AC. The future of scientific journals: Lessons from the past. Information Technology and Libraries 1994;13:239-47.

13. Odlyzko AM. The slow evolution of electronic publishing in Meadows AJ Rowland F. eds. Electronic Publishing '97: New Models and Opportunities, ICCC Press, 1997, pp. 4-18. Available from http://www.research.att.com/~amo/doc/eworld.html [accessed on 8/20/99]

14. Jacobson, M. Biomedical publishing and the Internet — the message of the medium. J of intensive care med. 1998;13:153-4 Available http://www.journalclub.org/vol2/n5.html [accessed on 8/25/99]

15. Kuhn TS. The structure of scientific revolutions. University of Chicago Press. 2nd. Ed. Chicago, 1970.

16. Library Groups, Decrying 'Excessive Pricing' demand new policies on electronic journals. The Chronicle of Higher Education April 10, 1990, A-33.

17. Bachrach S, Berry RS, Blume M, von Foerster T, Fowler A, Ginsparg P, Heller S, Kestner N, Odlyzko A, Okerson A, Wigington R, Moffat A. Who should own scientific papers? Science 1998; 281:1459-1460. Available from http://www.sciencemag.org/cgi/content/summary/280/5382/1459 [accessed 8/20/99]

18. Otto Kinne. Comments on E-Biomed: A proposal for Electronic Publications in the Biomendical Sciences, August 2-8, 1999. Available from http://www.nih.gov/welcome/director/ebiomed/comment.htm

19. Burbules NC, Bruce BC. This is not a paper Ed Researcher 1995;24(8):12-8.

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